Thwarting the Effects of Moisture & Corrosion

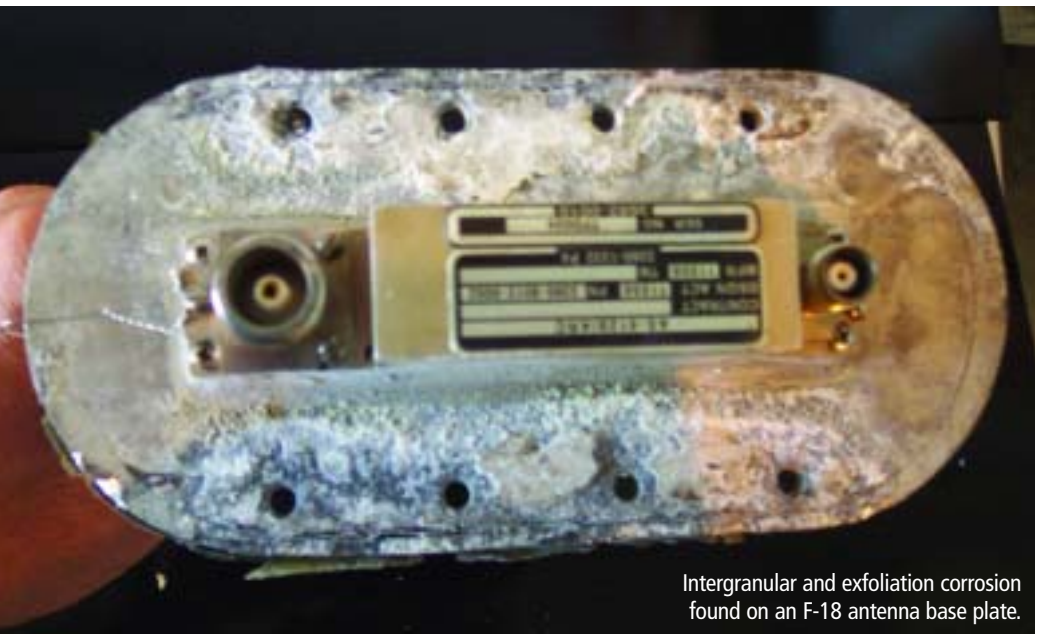
Safer Conductive Gasket Eliminates Corrosion on Antennas

Engineers from the Naval Air Systems Command (NAVAIR) have identified a new, environmentally-friendly conductive gasket that guards against moisture and subsequent corrosion while providing improved electrical bonding between aircraft aluminum substrate and the mounting base of aircraft antennas and static discharger mounts

Background

Corrosion maintenance on aircraft surfaces and attaching hardware is a frequent and costly problem. Attach points such as static wick mounts and blade antenna mating surfaces are just a few examples that are prone to moisture intrusion and subsequent corrosion that seriously degrade the performance of electronic equipment, especially communication systems. These problems acutely degrade mission availability and require frequent hardware replacement.

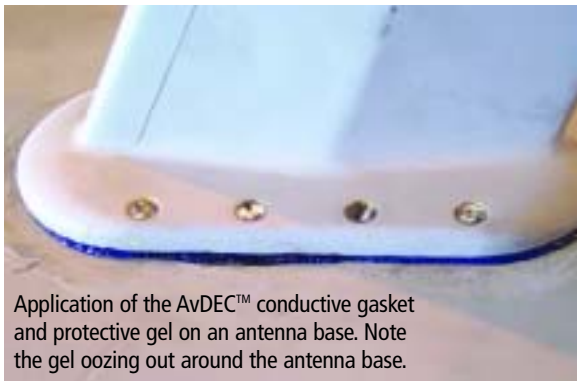
View of the conductive gasket consisting of a cured polyurethane gel encapsulating an aluminum wire mesh.



Intergranular and exfoliation corrosion found on an F-18 antenna base plate.

Established maintenance procedures require technicians, when they remove and replace an aircraft antenna or static wick mount, to apply a polysulfide sealant (MIL-PRF-81733 which contains hexavalent chromium as a corrosion inhibitor) around the perimeter of the base of the antenna base or mount to prevent moisture intrusion. Not only are the technicians being exposed to the carcinogens embedded within the sealant, but the excess sealant is a hazardous material and must be disposed of properly. Additionally, this is an extraordinarily labor and time intensive procedure and severely impacts aircraft availability and readiness.

The conductive gasket prevents the ingress of moisture into the area between the base of the antenna and the aircraft surface.



Application of the AvDEC™ conductive gasket and protective gel on an antenna base. Note the gel oozing out around the antenna base.

Solution: A Conductive Gasket

A new commercial-off-the-shelf-technology, produced by Aviation Devices and Electronic Components (AvDEC™), is a conductive gasket, consisting of a cured polyurethane gel encapsulating an aluminum wire mesh. NAVAIR engineers have identified this gasket to provide improved electrical bonding between aircraft aluminum substrate and the mounting base of aircraft antennas and static discharger mounts. Additionally, the conductive gasket is designed to prevent the ingress of moisture into the area between the base of the antenna/static discharger mount and the aircraft surface.

The focus of this technology is to seal and protect mating areas against moisture and subsequent corrosion while providing a mechanism for electrical bonding and grounding. The gasket is designed so that once the mounting screws are installed and torqued, compression squeezes some of the polyurethane gel to the outside perimeter of the antenna mount providing a small perimeter seal, thus eliminating the need for polysulfide sealing requirements. Additional benefits include the potential to eliminate airborne communication precipitation static (P-static) discrepancies caused by corrosion.

With approximately 4,000 aircraft in the Naval aviation community the use of the AvDEC™ conductive gasket will eliminate the requirement for using chromated polysulfide sealants, thus saving thousands of dollars in labor, material and disposal costs while improving mission readiness.

Results of Field Demonstrations

Engineers from NAVAIR's Aerospace Materials Division (AIR-4.3.4) conducted successful laboratory tests of the AvDEC™ gasket that included temperature resistance, fluid compatibility, corrosion, and lightning strike evaluations. The gasket material survived exposure to aircraft fluids and maintained its electrical performance (2.5 milliohms or less) throughout all conditions, including corrosion testing. Following these tests, AIR-4.3.4 engineers were granted approval to conduct field evaluations of the gasket material on the EA-6B, which is prone to P-static discrepancies, and the H-60 platforms.

The Lancers from Electronic Attack Squadron 131 (VAQ-131) was one of two operational squadrons selected to conduct an "at-sea" demonstration of the AvDEC™ conductive gasket technology. All aircraft antennas and static dischargers on two EA-6B Prowlers were outfitted with the gasket prior to the squadron's deployment. During the seven-month deployment, the two aircraft flew a combined 759 flight-hours, and did not experience a single P-static discrepancy during the deployment. Two of their aircraft without this technology experienced moderate to severe P-static discrepancies, and at times experienced a temporary loss of communication between the aircraft and the ship. The post deployment inspection of antennas and static dischargers revealed minimal peripheral corrosion on antenna mounting and static wick bases and aircraft aluminum surfaces

Benefits of AvDEC™ Conductive Gasket

1. Elimination of hazardous material and hazardous waste disposal costs by eliminating the need to apply a polysulfide sealant, which contains hexavalent chromium (a known carcinogen) as a corrosive inhibitor.
2. Reduction in labor requirement and health risks for maintenance personnel.
3. Elimination of airborne communication precipitation static (P-static) discrepancies caused by corrosion.
4. Increase in aircraft availability and readiness.

H-60 communications antenna before AvDEC™ gasket installation.

The same H-60 antenna after 546.5 hours of flight time while deployed aboard the USS HARRY S. TRUMAN.

where AvDEC™ gaskets were utilized, and was considered a success by the squadron and NAVAIR engineers.

The "Dusty Dogs" of Helicopter Antisubmarine Squadron Seven (HS-7) conducted a concurrent "at sea" demonstration of the AvDEC™ gaskets. The decision was made to use the AvDEC™ conductive gasket on the upper and lower communication (U/VHF) antennas, and waive the 28-day corrosion inspections of these antennas. Flight clearance was granted and the installation of the gasket was conducted at Naval Air Station Jacksonville, FL on an H-60 aircraft. The aircraft flew a total of 546.5 hours (467.8 of those hours at sea) and underwent its post deployment inspection antenna removal and inspection. Josh Honaker, the H-60 Avionics Engineer, at Naval Air Depot Cherry Point NC, stated in his technical report... "Post deployment inspection of the antennas revealed that they were in immaculate condition considering the amount of time they were exposed to saltwater without an inspection or any type of preventive maintenance treatment. The gasket sealing materials were easily removed with little effort and all antenna mounting surfaces and aircraft structure mounting surfaces that were sealed with AvDEC™ were free from visible corrosion. AvDEC™ gaskets provided complete base metal protection and the aircraft experienced no notable system discrepancies or degradation to any of the systems that were involved in the AvDEC™ evaluation." As a result, Honaker is recommending that the current inspection requirement for the upper and lower communication (U/VHF) antennas be extended to a 364-day inspection instead of the 28-day requirement currently established in the H-60 Maintenance Requirement Card (MRC) deck, which will drastically reduce man-hours, maintenance costs, and turn-around time.

Summary

In support of NAVAIR's goal to provide cost-wide readiness and support emerging Fleet requirements, NAVAIR is committed to enhancing fleet readiness while reducing environmental safety occupational and health risks to maintenance personnel. Based upon the successful laboratory and field demonstration/evaluations, AIR-4.3.4 has authorized the use of the AvDEC™ technology on all Navy and Marine Corps aircraft. Additionally, an Interim Rapid Action Change (IRAC) #7 to the Avionics Cleaning and Corrosion Prevention/Control Manual (NAVAIR 16-1-540) was issued in April 2004.

The conductive gaskets can be procured in bulk form or die cut to the footprint of the antenna or static wick mount base. Transition of this technology to the Naval aviation community is made through the concurrence of the applicable platform Field Service Team and Program Manager-Air. Currently, the first two platforms to transition to the AvDEC™ gasket will be the EA-6B and H-60. ⚓

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